

COMMERCIAL FISHERIES REVIEW

February 1961

Washington 25, D. C.

Vol. 23, No. 2

GULF OF MEXICO TRAWL FISHERY FOR INDUSTRIAL SPECIES

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ABSTRACT

During 1958 and 1959, sampling of the trawl-caught industrial fish, used chiefly in the petfood industry of the northern Gulf, showed the large variety of species taken, but about three-fourths of the catch consisted of croaker (*Micropogon undulatus*), spot (*Leiostomus xanthurus*), and silver trout (*Cynoscion nothus*). Fish are taken in the area from Mobile Bay to Ship Shoals in western Louisiana. The area fished comprises about 4,000 square miles between 0 and 20 fathoms. The bulk is taken east of the delta--the fishing west of the delta occurring chiefly during the winter months.

INTRODUCTION

Shrimp vessels in the Gulf of Mexico incidentally catch large quantities of fish of species and sizes unmarketable as human food. These fish were formerly discarded at sea and wasted, being invariably dead when thrown overboard. Although some of the incidental catches by

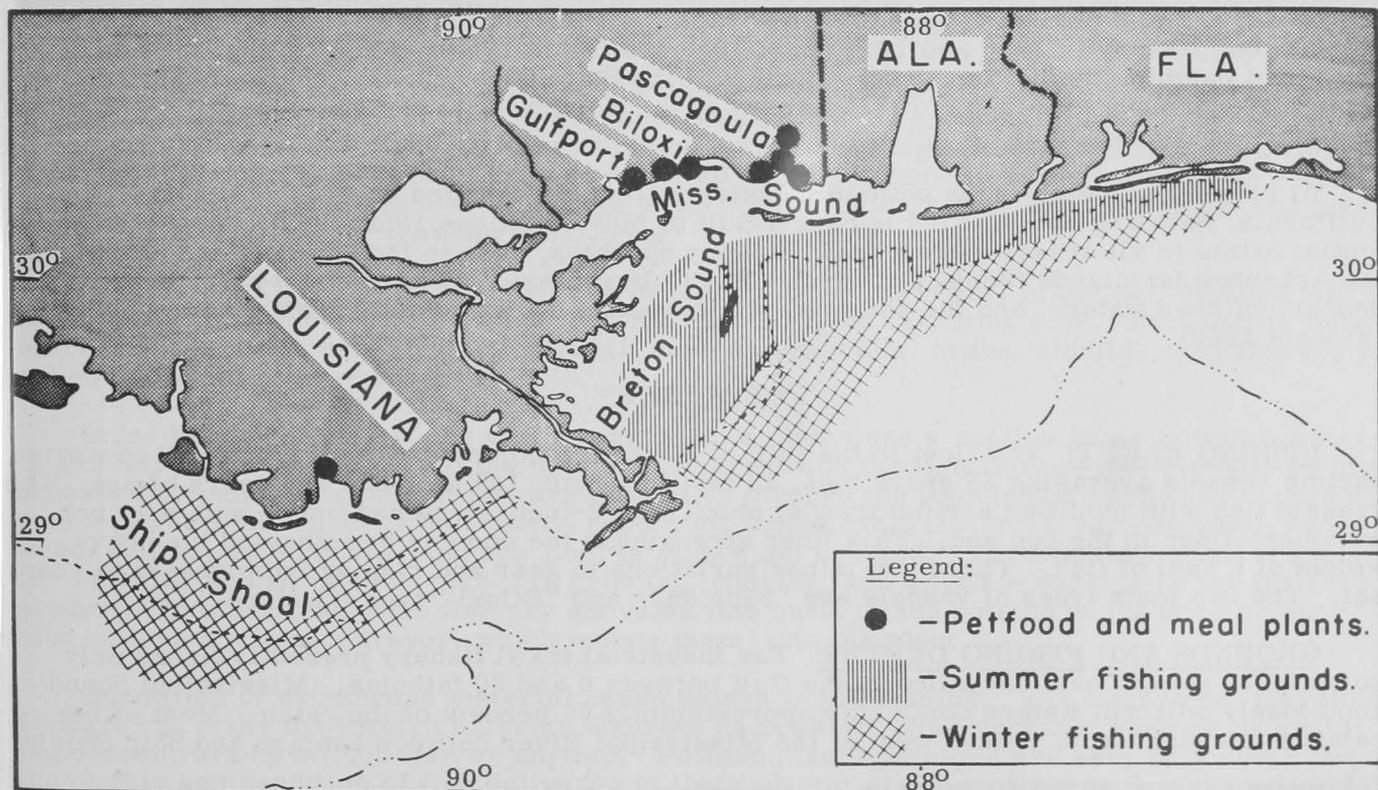


Fig. 1 - Fishing grounds used by trawlers of the industrial fishery in the Gulf of Mexico.

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shrimp vessels are landed, the bulk of the industrial trawl-caught fish on the Gulf Coast are caught by vessels fishing primarily for industrial fish.

A plant established at Pascagoula, Miss., in 1952, successfully experimented with the use of these discarded fish for petfood. The fishery grew rapidly when several additional plants in the northern Gulf area started processing the discarded fish. Some of these formerly-wasted bottom fish are quick-frozen in 50-pound blocks for use as animal food in the fur-farming industry, some are processed into canned petfoods, and some are converted into fish meal (utilized as a protein supplement in other animal foods such as prepared poultry rations).

The Feline Society, Inc., estimates that there are about 21 million cats in North America^{1/}. In 1958, the public spent more for petfoods than for baby foods (Coleman 1960). Recognition of the growing importance of this industry is shown by the inauguration on February 15, 1960, by the U. S. Department of Agriculture of the official inspection seal on petfoods which pass inspection (Gruber 1960).

Table 1 - Value of Total United States Petfood Consumption, 1958

Canned catfoods	\$220,200,000
Canned dogfoods	41,770,000
Other cat and dog foods	192,200,000
Total	\$485,620,000

A New England industrial trawl fishery developed about 10 years ago and has increased to approximately one-third of the total landings for the area in 1959 (Jones 1959). A brief survey of the "trash" fishery was made in New England in 1949 (Snow 1950). Then at the request of the Atlantic States Marine Fisheries Commission, a systematic sampling of landings was begun in 1950 (Sayles 1951). In 1955 a biological study was initiated (Edwards 1958a). This fishery takes only 44 species (Edwards 1958a) as compared to 175 species so far identified in Gulf of Mexico industrial fish landings. However, Gulf landings commonly consist of about 25 species, and the remainder appear incidentally.

The California petfood industry, which, like that in the Gulf, began in 1952, utilizes frozen whole fish, fish frames, and viscera. But the industry has grown in practically every area in California where there is a trawl fishery and it is using more than 3 million pounds of whole fish and 8 million pounds of fish scraps. California made an intensive study of their animal-food fishery in 1956 and 1957 (Best 1959 and Gates 1955). It is felt that the new fishery is not harming the bottom fish resources of the State (Best 1959). There appears to be room for enormous expansion of this fishery in the Northwest to at least 200 million pounds according to Jones (1959).

At present no large-scale petfood industry utilizing discarded species exists except in California, New England, and the northern Gulf of Mexico (Jones 1959-1960), although a potential exists in all areas where a trawl fishery operates, even in the Great Lakes States and the Arkansas farmlands (Jones *op. cit.*). The Gulf of Mexico fishery could be expanded into deeper unfished waters, and the potential for increased utilization of bottom fish is very great (Vincent 1950).

THE FISHERY

FISHING FLEET: The fleet in the Gulf of Mexico is comprised largely of small converted shrimp vessels averaging 33 gross tons, 53 feet in length, 185 hp., and 16½ years of age. The vessels fish with modified shrimp trawls, chiefly of 2-inch stretched mesh with a 1-inch bar-mesh liner in the cod end. This liner strengthens the cod end to withstand the heavy weight of a haul of fish. There are minor variations in gear and rigging from vessel to vessel. The two main types of vessels are "Florida"- and "Biloxi"-type trawlers.

GROUND AND FISHING DEPTHS: The industrial trawl fishery presently fishes only some 4,000 square nautical miles in the Gulf between 0 and 20 fathoms. Mississippi Sound and closely adjacent waters contribute approximately 65 percent of the catch. Most of the balance is caught from waters west of the Mississippi River between Empire and Ship Shoals, La.

^{1/}Wildlife Review, 1960, Fish and Game Branch, Department of Recreation and Conservation, no. 5, vol. 2 (April), Vancouver, B. C., p. 7.

The waters fished most heavily and consistently are from just east of Mobile Bay entrance (Alabama) to south of Chandeleur Island, Miss. In summer, fishing depths range mainly from 2 to 7 fathoms and in winter from 8 to 20 fathoms, but rarely deeper although the U. S. Bureau of Commercial Fisheries exploratory fishing vessel *Oregon* explorations show large numbers of bottom fish are available in deeper waters. If the fishery continues to expand, it will likely be extended farther offshore.

At times, some industrial fish landed at Apalachicola, Fla., have been shipped by truck to plants in Mississippi when landings were low in the Pascagoula area. Large schools of pelagic thread herring (*Opisthonema oglinum*) present off the west coast of Florida in the summer months, have been caught in seines and used to a limited extent to supplement trawl-caught fish landings at Pascagoula, Miss.

During the winter many boats from the Biloxi-Pascagoula area of Mississippi, especially those of larger size, fish west of the Mississippi River. Fishing is normally better there during the winter months, and parts of the western grounds are more sheltered from prevailing northeast winds. Depths fished approximate those utilized to the east, although depths to 29 fathoms are occasionally trawled.

Shallow waters extend far offshore and are characterized by a rich and varied ichthyofauna. Extensive inshore estuarine areas serve as nursery grounds for many species of fishes occurring in this fishery. The 10-fathom curve averages about 10 miles seaward, and the 100-fathom curve generally extends about 60 miles offshore, forming an unusually wide, shallow shelf. The bottom over this huge area is gray mud or gray sand and is almost level, making excellent bottom-trawling conditions.

HANDLING THE FISH: The fish are brought aboard the vessel in the net, dumped into the fish hold, and iced down with crushed ice carried from the home port. During this icing process much of the undesirable material, such as seashells, crabs, starfish, and sharks, is culled out and thrown overboard.

Unloading processes at the ports vary. Some plants use a suction pump in which a flexible metal pipe is lowered into the hold of the vessel and the fish flushed into the pipe by high pressure streams of water. They are sucked up through the pipe into a washer and come out onto a metal-link conveyor belt where remaining undesirable material, such as shell, seaweed, sharks, rays, crabs, and sea lice, is picked out by hand. The fish then cross a scale for weighing and go into the plant for grinding, cooking, and ultimate canning as the finished product. In other plants the fish are shoveled into buckets and hoisted to the dock or shoveled onto an endless conveyor, which moves them into the plant.

Quantities of extraneous material cause delays in processing. The fishermen, therefore, endeavor to make their catch as clean and free as possible from unusable species by avoiding concentrations of food fish or shrimp. Petfood plant operators are very particular about the quality and condition of fish delivered to their plants; slight spoilage will cause a load to be rejected. The rejected fish are normally made into fish meal or discarded.

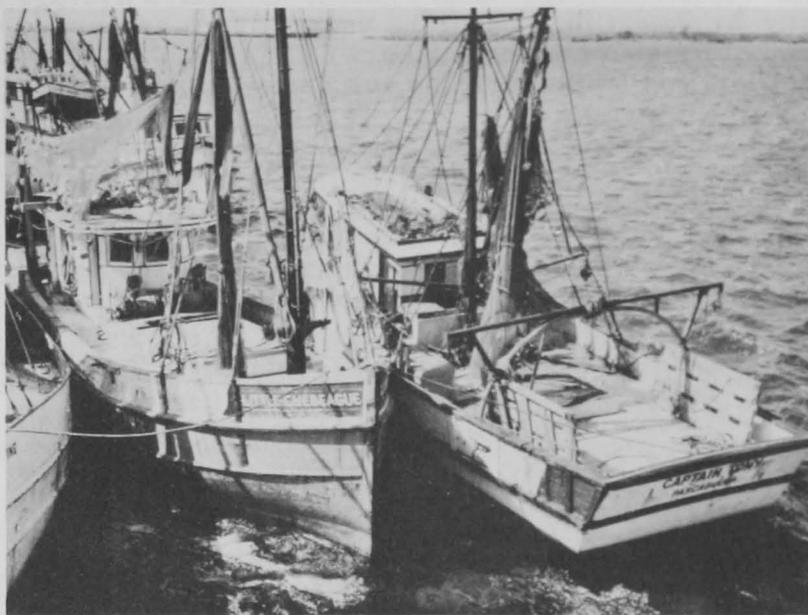


Fig. 2 - A single- and a double-rig trawler at a petfood plant in a Gulf Coast port.

SPECIES COMPOSITION IN GULF OF MEXICO FISHERY: The dominant species, croaker (*Micropogon undulatus*), spot (*Leiostomus xanthurus*), and silver trout (*Cynoscion nothus*), are present in all waters fished throughout the year and make up approximately 75 percent of the total industrial trawl fishery catch. Croakers average about 50 to 55 percent of the total catch by weight throughout the year. There appears to be little coastwise migratory movement of croakers in the northern Gulf, such as is reported for the Chesapeake Bay area (Haven 1957 and 1959; Massman and Pacheco 1960), although Suttkus (1955) recorded considerable

Table 2 - Species Composition of Gulf of Mexico Industrial Trawl Fishery Catches by Weight, 1959

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Anchovy (<i>Anchoa</i> sp.) (2 species)	-	1.18	1.62	2.72	1.44	1.92	2.05	1.73	2.18	-	-	-
Butterfish (<i>Poronotus tricanthus</i>)	-	-	-	-	1.24	-	-	-	-	2.75	-	-
Catfish, sea (<i>Galeichthys felis</i>)	2.41	1.79	3.34	3.03	5.76	4.35	4.71	3.86	4.73	1.65	1.25	-
Croaker (<i>Micropogon undulatus</i>)	41.41	62.98	49.81	53.65	51.74	55.65	46.02	44.02	41.04	40.20	54.97	55.17
Croaker, banded (<i>Larimus fasciatus</i>) . . .	2.19	1.50	-	2.60	-	-	-	-	1.17	2.12	-	-
Flounder (<i>Paralichthys</i> sp.) (2 species) .	-	-	-	-	-	-	-	-	-	-	-	1.30
Lizardfish (<i>Synodus foetens</i>)	-	-	-	-	1.12	-	-	-	-	2.06	5.76	3.82
Menhaden (<i>Brevoortia</i> sp.) (3 species) . .	3.28	-	1.69	2.54	2.21	4.27	1.12	-	-	4.32	6.13	1.00
Porgy (<i>Stenotomus</i> sp.) (2 species) . . .	-	3.72	3.48	2.28	6.99	-	-	-	-	-	-	1.65
Razorbelly (<i>Harengula pensacolae</i>)	-	-	-	2.13	3.50	10.24	3.26	2.64	3.79	5.01	1.77	-
Sea robin (<i>Prionotus</i> sp.) (2 species) . .	-	-	1.26	-	-	-	-	-	-	-	-	1.25
Silver eel (<i>Trichiurus lepturus</i>)	-	-	-	1.62	3.42	4.13	6.11	4.08	7.23	7.66	1.05	-
Spot (<i>Leiostomus xanthurus</i>)	29.34	9.03	5.80	10.95	9.00	12.81	17.35	11.89	16.70	9.48	4.96	20.99
Star drum (<i>Stellifer lanceolatus</i>)	-	-	-	2.36	2.11	-	-	-	-	-	-	-
Threadfin (<i>Polydactylus octonemus</i>)	-	-	-	-	-	1.19	1.94	1.90	-	-	-	-
Trout, silver (<i>Cynoscion nothus</i>)	12.45	13.23	24.91	10.13	3.18	2.31	5.55	8.26	11.32	13.50	6.51	2.66
Whiting (<i>Menticirrhus</i> sp.) (2 species) . .	1.65	2.15	-	-	1.82	-	1.52	1.28	1.86	1.71	3.46	3.78
Miscellaneous (less than 1%)	7.27	4.42	8.09	5.99	6.47	3.13	10.37	20.34	9.98	9.54	14.14	8.38

seasonal movement along the Louisiana east coast from Lake Pontchartrain. A tagging program is needed to provide more detailed knowledge of local migrations.

Spot and silver trout constitute about 10 percent, respectively, while miscellaneous species comprise the balance of the catch. Other species contributing heavily to the total catch according to the season of the year are hardhead catfish (*Galeichthys felis*), razorbellies (*Harengula pensacolae*), lizardfish (*Synodus foetens*), cutlassfish (*Trichiurus lepturus*), and Atlantic threadfin (*Polydactylus octonemus*). Some species, such as, razorbellies and threadfin, disappear from the fishery during the winter months and reappear as the water warms in the spring.

Species generally termed "sport fish" or "food fish" are rarely caught, comprising less than one-half of one percent of the total catch. Out of 175 species identified, only about 20 species might be termed "sport fish." Of these 20 species many occur so infrequently as to be considered rare or unusual. The effects of the trawl fishery on sport fish and shrimp were reviewed by Gunter (1956), who felt it was not damaging to those species.

In New England, studies by Morrow (1951) of the long-horned sculpin and the "trash" fishery indicated "... continuation of the fishery might actually have a beneficial effect on the fishing industry as a whole in this region."

The silver trout commonly caught in large numbers is generally regarded as an inferior sport fish when compared to the other sea trouts (such as, the speckled trout, *Cynoscion nebulosus*, and sand trout, *Cynoscion arenarius*) both because of the small size usually attained and the rapid softening and deterioration of the meat.

In December and January 1958-59, 369,536 pounds of trawl-caught industrial fish were landed at Pascagoula, Miss. From 12 random 20-pound samples with a total of 437.3 pounds, 17 red snapper (*Lutianus aya*) were taken amounting to only 0.63 percent by weight. The percentage is considerably lower for most other species. Studies of fish taken in shrimp trawls (Siebenaler 1952 and 1953^{2/}; and Miles 1951^{3/}), gear similar to that of the industrial trawl fishery, also indicated the rare occurrence of "sport fishes" in trawl catches.

^{2/}Siebenaler, J. B., 1953. "Fishes Taken by the M/V *Oregon* in Shrimp Trawls off the Coast of Mississippi, 1950-1952." Unpublished report, mimeo., 7 pp.

^{3/}Miles, Robley M., 1951. "An Analysis of the 'Trash Fish' of Shrimp Trawlers Operating in Apalachicola Bay and the Adjacent Gulf of Mexico." Unpublished manuscript thesis, Florida State University, 46 pp.

A total of 636 landings have been sampled in 19 months. These samples show that with rare exceptions all fish taken in industrial fish trawls are of small size, even when mature, and hence are unsuitable for either human consumption or sport fishing. The average size of a mature fish is about 5 to 8 inches.

Croaker, spot, and silver trout are the dominant species both east and west of the Mississippi River. However, at times, almost an entire catch will consist of a single species, usually cutlassfish or silver trout. The average size of fish is slightly larger west of the delta.

The few flounders (Paralichthys sp.) taken are sold for human consumption, but even this species occurs in very small numbers and only in the summer months. Striped sole (Achirus lineatus), hogchoker (Trinectes maculatus), and tongue sole (Symphurus plagiusa), all of very small size, are the most common flatfish appearing in industrial fish landings.

Studies of gonad development reveal that some of the species common to the northern Gulf area spawn throughout the calendar year.

SPECIES COMPOSITION - OTHER FISHERIES: In the New England industrial trawl fishery red hake (Urophycis chuss) is the principal species, comprising 68 percent of the New Bedford landings for 1956 (Edwards and Lux 1958). This species compares in importance to the croaker of the Gulf fishery. Without these two species no industrial fishery would exist in either area. Other important species of the New England fishery are whiting (Merluccius bilinearis), comprising about 13 percent, and two skates (Raja erinacea and Raja ocellata), comprising 7 percent in 1956. The four species constitute the greatest part of all industrial species landed in New England. There are a total of 44 species as compared to 175 species in the Gulf fishery and 35 species in the California area.

Thirty-five species have been observed in the animal-food landings in California. Of these, arrowtooth flounder (Atheresthes stomias), Pacific hake (Merluccius productus), and the sablefish (Anoplopoma fimbria) make up approximately 75 percent by weight of all fish used in animal foods. These fishes are also unmarketable by reason of size or species and were previously discarded at sea (Best 1959) as in the Gulf shrimp fishery.

SUMMARY AND CONCLUSIONS

For many years shrimp fishermen have been discarding large quantities of finfish incidentally caught with their shrimp fishing. In 1952 a pilot plant in Pascagoula, Miss., commenced utilizing these otherwise unmarketable fish for petfood. Most of these fish, which were formerly discarded, are quick-frozen for use in the fur-farming industry, canned as petfood; or made into fish meal (used as a protein supplement in prepared animal rations). The new industry has expanded rapidly, and there is every indication it will continue to grow.

Intensive sampling of landings since January 1959 shows croaker, spot, and silver trout to be the dominant species throughout the year in the Gulf of Mexico industrial trawl fishery. Other important species are razorbellies, lizardfish, Atlantic threadfin, and hardhead catfish, but a total of 175 species from 76 families have been identified thus far. Sport fish and food fish contribute a negligible part of the total catch of bottom fish.

Individuals in the dominant species group rarely grow over 5 to 8 inches even when fully mature. Life history studies show that some species spawn throughout the year in the northern Gulf area.

Fishing grounds extend from Perdido Bay, Fla., on the east to Ship Shoals, La., on the west, in depths ranging from 2 to 29 fathoms of water.

Indications of a growing market for petfood for some 21 million cats in North America and the large potential yield of the bottom fishery of the Gulf appear to favor expansion of the industrial fishery. There are no indications that the industry is adversely affecting pres-

ently-exploited populations. Fishing could be extended into deeper unfished waters, and the potential for increased utilization of bottom fish is very great.

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